Technical Information
Deltabar M PMD55
Differential pressure measurement

Differential pressure transmitter with metal sensor; communication via HART, PROFIBUS PA or FOUNDATION Fieldbus

Application
The Deltabar M differential pressure transmitter is used for the following measuring tasks:

- Flow measurement (volume or mass flow) in conjunction with primary elements in gases, vapours and liquids
- Level, volume or mass measurement in liquids
- Differential pressure monitoring, e.g. of filters and pumps

Your benefits

- Reference accuracy: 0.1%
  as PLATINUM version: up to 0.075%
- Turn down up to 100:1
- Compact transmitter design
- Quick commissioning via DIP switches
- Easy and safe menu-guided operation
  - onsite via display module
  - via 4 to 20 mA with HART
  - via PROFIBUS PA
  - via FOUNDATION Fieldbus
- Continuous modularity for differential pressure, hydrostatic and pressure (Deltabar M, Deltapilot M Cerabar M), e.g.
  - replaceable display
  - universal electronics
- International usage thanks to a wide range of approvals
- Used for process pressure monitoring up to SIL2, certified to IEC 61508 Edition 2.0 and IEC 61511 by TÜV NORD

Endress+Hauser
People for Process Automation

Table of contents

Document information

Document conventions

Safety symbols

Symbol	Meaning
 A0011189-EN	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-EN	**WARNUNG!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-EN	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or moderate injury.
 A0011192-EN	**NOTE!** This symbol contains information on procedures and other facts, which do not result in personal injury.

Electrical symbols

Symbol	Meaning
A0018335	**Direct current** A terminal at which DC voltage is present or through which direct current flows.
A0018336	**Alternating current** A terminal at which AC voltage is present or through which alternating current flows.
 A0018337	**Direct current and alternating current** ▪ A terminal at which AC voltage or DC voltage is present. ▪ A terminal through which alternating current or direct current flows.
 A0018338	**Ground connection** A grounded terminal which, from the operator's point of view, is grounded via a grounding system.
 A0018339	**Protective ground connection** A terminal that must be connected to ground before other connections may be established.
 A0011201	**Equipotential connection** A connection that must be made with the plant grounding system; depending on national or company codes of practice, this may be a potential matching line or a star-shaped grounding system, for example.

Tool symbols

Symbol	Meaning
 A0011219	Phillips head screwdriver
 A0011220	Flat blade screwdriver
 A0013442	Torx screwdriver
 A0011222	Hexagon wrench
 A0011221	Allen key

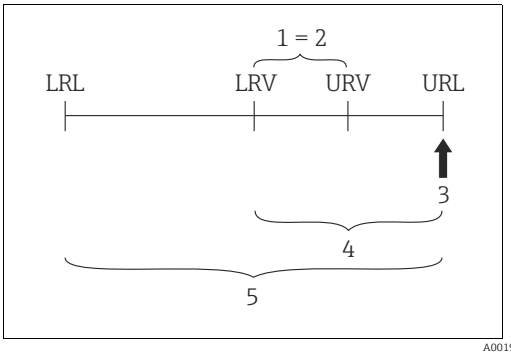
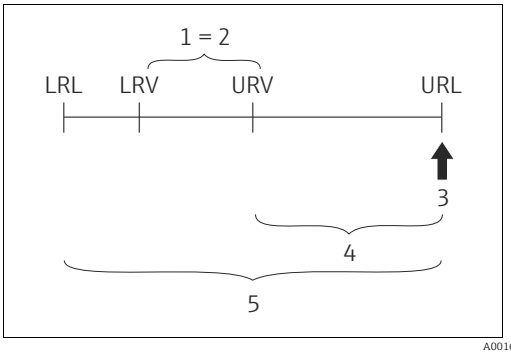
Symbols for types of information

Symbol	Meaning
 A0011182	**Allowed** Indicates procedures, processes or actions that are allowed.
 A0011183	**Preferred** Indicates procedures, processes or actions that are preferred.
 A0011184	**Forbidden** Indicates procedures, processes or actions that are forbidden.
 A0011193	**Tip** Indicates additional information.
 A0015483	**Reference to documentation** Refers to the relevant device documentation.
 A0015484	**Reference to page** Refers to the relevant page number.
 A0015486	**Reference to graphics** Refers to the relevant graphic number and page number.
1. , 2. , ...	Series of steps
 A0015488	**Help in the event of a problem**

Symbols in graphics

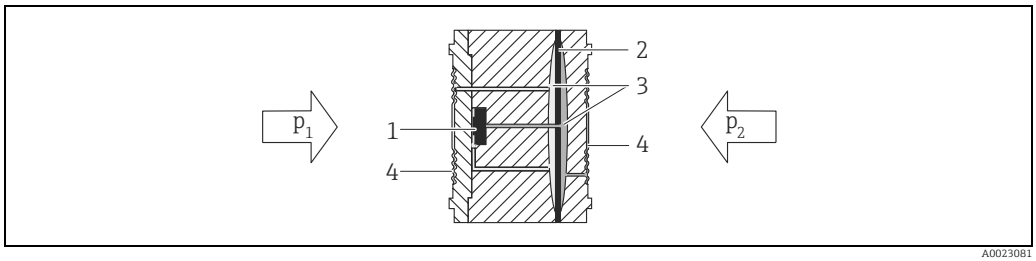
Symbol	Meaning
1, 2, 3, 4, ...	Numbering for main positions
1. , 2. , ...	Series of steps
A, **B**, **C**, **D**, ...	Views
A-A, **B-B**, ...	Sections
 A0011187	**Hazardous area** Indicates a hazardous area.
 A0011188	Safe area (non-hazardous area) Indicates a non-hazardous area.

Terms and abbreviations

Term/abbreviation	Explanation
MWP	The MWP (maximum working pressure) for the individual sensors depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection must be taken into account in addition to the measuring cell. Also observe the pressure-temperature dependency. For the relevant standards and additional information, see the "→ 31" section.
OPL	The OPL (over pressure limit) for the sensor depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection must be taken into account in addition to the measuring cell. Also observe the pressure-temperature dependency. For the relevant standards and additional information, see the "→ 31" section.
LRL	Lower range limit
URL	Upper range limit
LRV	Lower range value
URV	Upper range value
TD	**Turn Down (TD)**
Case 1: ▪ |Lower range value| ≤ |Upper range value| *Example:* ▪ Lower range value (LRV) = 0 mbar ▪ Upper range value (URV) = 100 mbar (1.5 psi) ▪ Nominal value (URL) = 500 mbar (7.5 psi) *Turn down:* ▪ TD = URL / |URV| = 5:1 *set span:* ▪ URV − LRV = 100 mbar (1.5 psi) This span is based on the zero point.	 *Example: 500 mbar (7.5 psi) sensor*
Case 2: ▪ |Lower range value| ≥ |Upper range value| *Example:* ▪ Lower range value (LRV) = −300 mbar (-4.5 psi) ▪ Upper range value (URV) = 0 bar ▪ Nominal value (URL) = 500 mbar (7.5 psi) *Turn down:* ▪ TD = URL / |(LRV)| = 1.67:1 *set span:* ▪ URV − LRV = 300 mbar (4.5 psi) This span is based on the zero point.	 *Example: 500 mbar (7.5 psi) sensor* *1 Set span* *2 Zero based span* *3 Nominal value≙ upper range limit (URL)* *4 Nominal measuring range* *5 Sensor measuring range*

Function and system design

Measuring principle



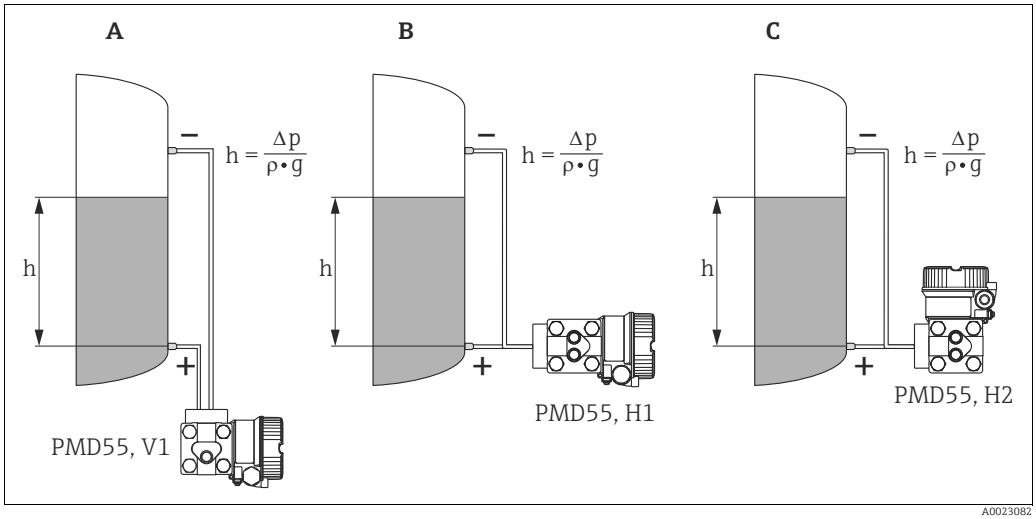
Measuring cell of the Deltabar M

1 Sensing element
2 Overload diaphragm/Middle diaphragm
3 Filling oil
4 Process isolating diaphragm

The metal separating diaphragms (4) are deflected on both sides by the acting pressures p_1 and p_2. A filling oil (3) transfers the pressure to a resistance circuit bridge (semiconductor technology). The differential-pressure-dependent change of the bridge output voltage is measured and further processed.

Level measurement (level, volume and mass)

Design and operation mode



Level measurement with Deltabar M

A Version V1; vertical impulse line; 90° alignment
B Version H1; horizontal impulse line; 180° alignment
C Version H2; horizontal impulse line; 90° alignment

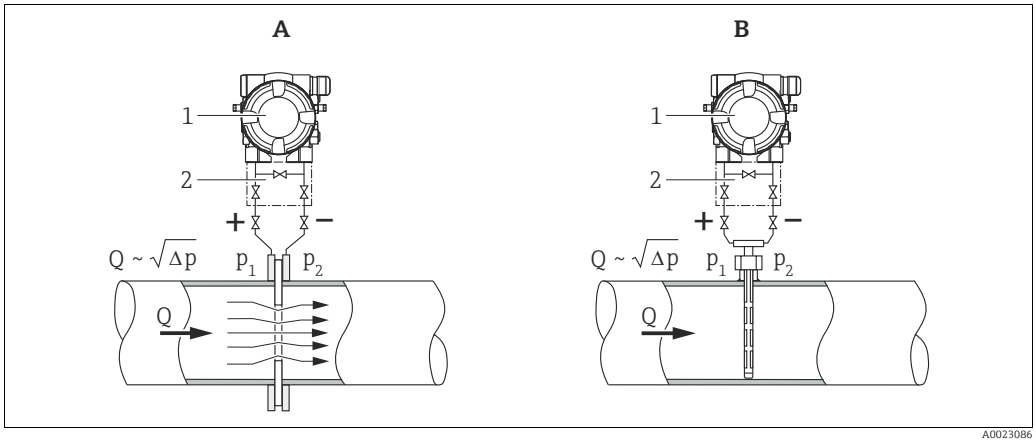
h Height (level)
Δp Differential pressure
ρ Density of the medium
g Gravitation constant

Your benefits

- Volume and mass measurements in any tank shapes by means of a freely programmable characteristic curve
- Choice of diverse level units
- Has a wide range of uses, e.g.
  - for level measurement in tanks with superimposed pressure
  - in the event of foam formation
  - in tanks with agitators of screen fittings
  - in the event of liquid gases
  - for standard level measurement

Flow measurement

Design and operation mode



Flow measurement with Deltabar M PMD55 and Deltatop primary element

A *with orifice plate*
B *with Pitot tube*

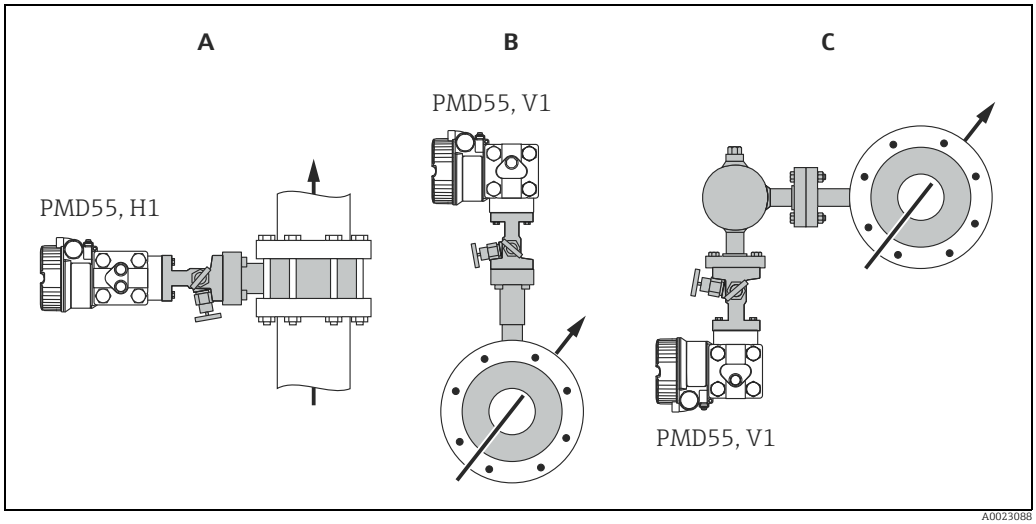
1 *Deltabar M PMD55*
2 *3-valve manifold*
Q *Flow*
Δp *Differential pressure, $\Delta p = p_1 - p_2$*

Your benefits

- Choice between five flow modes of operation:
  - Volume flow
  - Norm volume flow (European norm conditions)
  - Standard volume flow (American standard conditions)
  - Mass flow
  - %
- Choice of diverse flow units with automatic unit conversion.
- Low flow cut off: when activated, this function suppresses small flows which can lead to large fluctuations in the measured value.
- Contains two totalizers as standard. One totalizer can be reset to zero.
- The totalizing unit can be individually set for each totalizer. This allows independent daily and annual quantity totalizing.

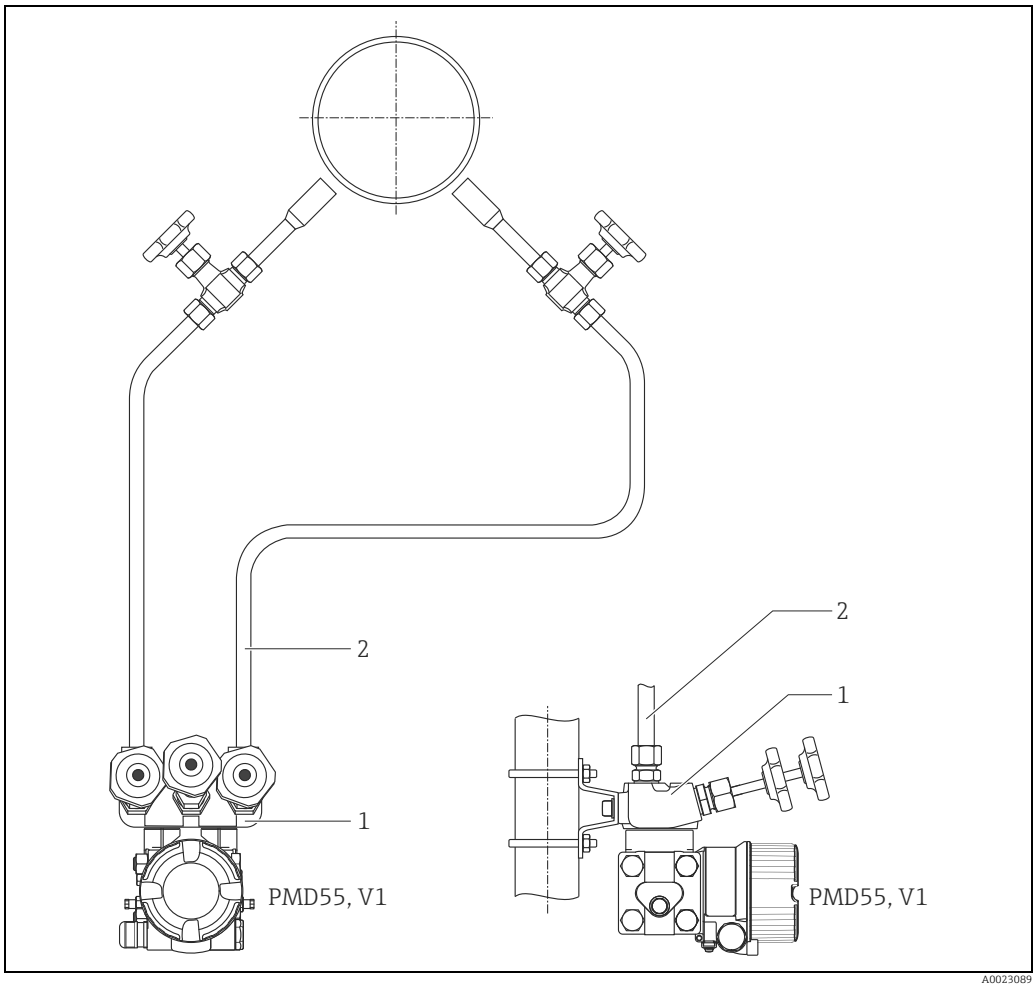
For more information about the Deltatop flow measurement system, see
TI00422P: Deltatop Differential Pressure Flow Measurement with Orifices
TI00425P: Deltatop Differential Pressure Flow Measurement with Pitot Tubes

Typical arrangements for flow measurements



A Liquid in vertical pipe; H1 version; horizontal impulse line; 180° alignment
B Gas in horizontal pipe; V1 version; vertical impulse line; 90° alignment
C Vapour in horizontal pipe; V1 version; vertical impulse line; 90° alignment

Mounting example



1 Valve manifold
2 Impulse line

Communication and data processing

- 4 to 20 mA with HART communication protocol
- PROFIBUS PA
  - The Endress+Hauser devices meet the requirements of the FISCO model.
  - Due to the low current consumption of 11 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO:
    - up to 8 Deltabar M for Ex ia, CSA IS and FM IS applications
    - up to 31 Deltabar M for all other applications, e.g. in non-hazardous areas, Ex nA, etc.

  Further information on PROFIBUS PA can be found in Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and in the PNO Guideline.
- FOUNDATION Fieldbus
  - The Endress+Hauser devices meet the requirements of the FISCO model.
  - Due to the low current consumption of 16 mA ± 1 mA, the following number of devices can be operated on one bus segment if installing as per FISCO:
    - up to 6 Deltabar M for Ex ia, CSA IS and FM IS applications
    - up to 22 Deltabar M for all other applications, e.g. in non-hazardous areas, Ex nA, etc.

  Further information on FOUNDATION Fieldbus, such as requirements for bus system components can be found in Operating Instructions BA00013S "FOUNDATION Fieldbus Overview".

Input

Measured variable

Differential pressure, from which flow (volume or mass current) and level (level, volume or mass) are derived.

Measuring range

Nominal value [mbar (psi)]	Measurement limit lower (LRL) [mbar (psi)]	Measurement limit upper (URL) [mbar (psi)]	Smallest span (factory calibration) [1] [mbar (psi)]	MWP [bar (psi)]	OPL on one side [bar (psi)]	OPL on both sides [bar (psi)]	Min. operating pressure [2] [$mbar_{abs}$ (psi_{abs})]	Version [3]
10 (0.15)	−10 (− 0.15)	+10 (+ 0.15)	0.5 (0.0075)	1 (15) [4]	1 (15) [4]	1.5 (22.5) [4]	0.1 (0.0015) [4]	7B
30 (0.45)	−30 (− 0.45)	+30 (+ 0.45)	1.5 (0.0225)					7C
100 (1.5)	−100 (− 1.5)	+100 (+ 1.5)	5 (0.075)	70 (1050) [5] 160 (2400) [6]	70 (1050) [5] 160 (2400) [6]	105 (1575) [5] 240 (3600) [6]	0.1 (0.0015) [5] 0.1 (0.0015) [6]	7D
500 (7.5)	−500 (− 7.5)	+500 (+ 7.5)	25 (0.375)					7F
1000 (15)	-1000 (− 15)	+1000 (+ 15)	50 (0.75)					7G
3000 (45)	−3000 (− 45)	+3000 (+ 45)	150 (2.25)					7H
16000 (240)	−16000 (− 240)	+16000 (+ 240)	800 (12)					7L
40000 (600)	−40000 (− 600)	+40000 (+ 600)	2000 (30)					7M

1) Recommended Turn down: Max 100:1.
Factory calibration Turn down: Max 20:1

2) The minimum operating pressure indicated in the table applies to silicone oil under reference operating conditions. Minimum operating pressure at 85°C (185°F) for silicone oil: 10 mbar (0.15 psi) (abs)

3) Product Configurator, "Sensor Nominal Value" section

4) Version "2" in the Order Code - Feature 60

5) Version "6" in the Order Code - Feature 60

6) Version "7" in the Order Code - Feature 60

Nominal Pressure PN	Version [1]
Prepared for Deltatop	D
1 bar / 100 kPa/ 14.5 psi	2
70 bar / 7 MPa / 1015 psi	6
160 bar / 16 MPa / 2400 psi	7

1) Product Configurator "Nominal Pressure PN" section

Output

Output signal

- 4 to 20 mA with superimposed digital communication protocol HART 6.0, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.02)
- Digital communication signal FOUNDATION Fieldbus

Output	Version [1]
4 to 20mA HART	2
PROFIBUS PA	3
FOUNDATION Fieldbus	4

1) Product Configurator "Output" section

Signal range – 4 to 20 mA HART

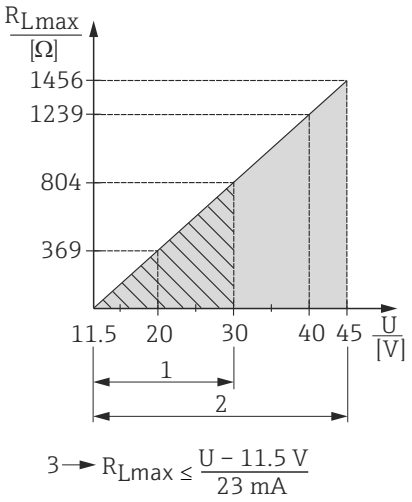
3.8 mA to 20.5 mA

Signal on alarm

As per NAMUR NE 43

- 4 to 20 mA HART
  Options:
  - Max. alarm*: can be set from 21...23 mA (factory setting: 22 mA)
  - Keep measured value: last measured value is kept
  - Min. alarm: 3.6 mA
- PROFIBUS PA: can be set in the Analog Input block,
  Options: Last Valid Out Value (factory setting), Fail-safe Value, Status Bad
- FOUNDATION Fieldbus: can be set in the Analog Input block,
  Options: Last Good Value, Fail-safe Value (factory setting), Wrong Value

Load – 4 to 20 mA



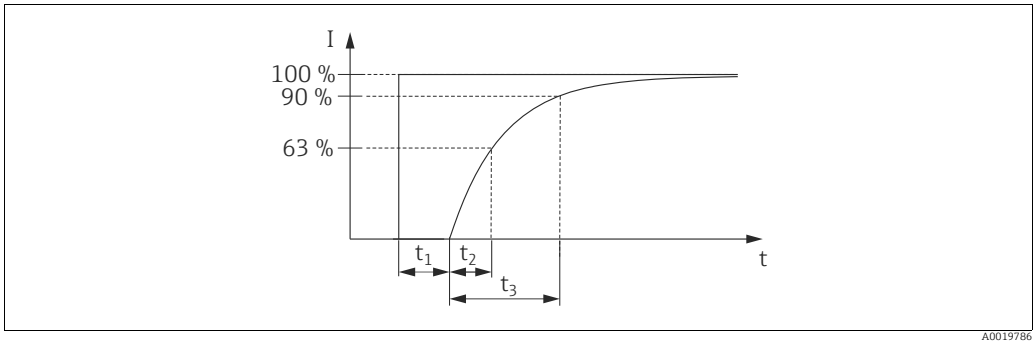
A0023090

Load diagram

1 Supply voltage 11.5 ... 30 V DC for intrinsically safe instrument versions
2 Supply voltage 11.5 ... 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified instrument versions
R_{Lmax} Maximum load resistance
U Supply voltage

When operating via a handheld terminal or via PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

Dead time, Time constant



Presentation of the dead time and the time constant

Dynamic behavior: current output

	Dead time (t_1) [ms]	Time constant T63 (= t_2) [ms]	Time constant T90 (= t_3) [ms]
max.	60	90	210

Dynamic behavior: digital output (HART electronics)

	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (= t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (= t_3) [ms]
min.	220	310	370
max.	1020	1110	1170

Reading cycle

- Acyclic: max. 3/s, typical 1/s (depends on command # and number of preambles)
- Cyclic (Burst): max. 3/s, typical 2/s

The Deltabar M commands the BURST MODE function for cyclic value transmission via the HART communication protocol.

Cycle time (update time)

Cyclic (Burst): min. 300 ms

Response time

- Acyclic: min. 330 ms, typical 590 ms (depends on command # and number of preambles)
- Cyclic (Burst): min. 160 ms, typical 350 ms (depends on command # and number of preambles)

Dynamic behavior: PROFIBUS PA

	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (= t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (= t_3) [ms]
min.	95	185	245
max.	1195	1285	1345

Reading cycle

- Cyclic: max. 30/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 25/s

Cycle time (update time)

Min. 100 ms. The cycle time in a bus segment in cyclic data communication depends on the number of devices, on the segment coupler used and on the internal PLC cycle time.

Response time

- Cyclic: approx. 8 to 13 ms (depends on Min. Slave Interval)
- Acyclic: approx. 23 to 35 ms (depends on Min. Slave Interval)

Dynamic behavior: FOUNDATION Fieldbus

	Dead time (t_1) [ms]	Dead time (t_1) [ms] + Time constant T63 (= t_2) [ms]	Dead time (t_1) [ms] + Time constant T90 (= t_3) [ms]
min.	105	195	255
max.	1105	1195	1255

Reading cycle

- Cyclic: max. 10/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 5/s

Cycle time (update time)

Cyclic: min. 100 ms

Response time

- Cyclic: max. 20 ms (for standard bus parameter settings)
- Acyclic: typical 70 ms (for standard bus parameter settings)

Damping

A damping affects all outputs (output signal, display).

- Via onsite display, handheld terminal or PC with operating program, continuous from 0...999 s
- Via DIP-switch on the electronic insert, switch position "on" (= set value) and "off" (= damping switched off)
- Factory setting: 2 s

Firmware version

Designation	Version [1]
01.00.zz, HART, DevRev01	78

1) Product Configurator "Firmware version" section

Protocol-specific data

HART

Manufacturer ID	17 (11 hex)
Device Type Code	33 (21 hex)
Device Revision	01 (01 hex) - SW version 01.00.zz
HART specification	6
DD Revision	▪ 01 (netherlands) ▪ 02 (russian)
Device description files (DTM, DD)	Information and files can be found: ▪ www.endress.com ▪ www.hartcomm.org
HART load	Min. 250 Ω
HART device variables	The measured values can be freely assigned to the device variables: **Measured values for PV (primary variable)** ▪ Pressure ▪ Flow ▪ Level ▪ Tank content **Measured values for SV, TV (second and third variable)** ▪ Pressure ▪ Level ▪ Totalizer
Supported functions	▪ Burst mode ▪ Additional Transmitter Status ▪ Device Locking ▪ Alternative operating modes

PROFIBUS PA

Manufacturer ID	17 (11 hex)
Ident number	1554 hex
Profile Version	3.02 SW Version 01.00.zz
GSD Revision	5
DD Revision	1
GSD File DD Files	Information and files can be found: ▪ www.endress.com ▪ www.profibus.org
Output values	**Measured values for PV (via Analog Input Function Block)** ▪ Pressure ▪ Flow ▪ Level ▪ Tank content **Measured values for SV** ▪ Pressure **Measured values for QV** ▪ Totalizer
Input values	Input value sent from PLC, can be shown on display
Supported functions	▪ Identification & Maintenance Simple device identification via control system and nameplate ▪ Condensed status ▪ Automatic ident number adaptation and switchable to following ident numbers: – 9700: Profile-specific transmitter identification number with the "Classic" or "Condensed" status". – 1554: Identification number for Deltabar M. ▪ Device locking: The device can be locked by hardware or software.

Data of the FOUNDATION Fieldbus interface

Basic data

Device Type	0x1021
Device Revision	01 (hex)
DD Revision	0x01021
CFF Revision	0x000102
ITK Version	5.2.0
ITK Certification Driver No.	IT067600
Link-Master (LAS) capable	Yes
Link Master / Basic Device selectable	Yes; Factory setting: Basic Device
Number of VCRs	44
Number of Link Objects in VFD	50
Number of FB-Schedule Objects	40

Virtual communication references (VCRs)

Permanent Entries	44
Client VCRs	0
Server VCRs	5
Source VCRs	8
Sink VCRs	0
Subscriber VCRs	12
Publisher VCRs	19

Link settings

Slot time	4
Min. inter PDU delay	12
Max. response delay	40

Transducer Blocks

Block	Content	Output values
TRD1 Block	Contains all parameters related to the measurement	▪ Pressure or level (channel 1) ▪ Process temperature (channel 2) ▪ Measured pressure value (channel 3) ▪ Max. pressure (channel 4) ▪ Level before linearization (channel 5)
Dp Flow Block	enthält Durchfluss und Summenzähler Parameter	▪ Totalizer 1 (channel 6) ▪ Totalizer 2 (channel 7)
Diagnostic Block	Contains diagnostic information	▪ Error code via DI channels (channel 10 to 15)
Display Block	Contains parameters to configure the onsite display	No output values

Function blocks

Block	Content	Number of blocks	Execution time	Functionality
Resource Block	The Resource Block contains all the data that uniquely identify the device. It is an electronic version of a nameplate of the device.	1		enhanced
Analog Input Block 1 Analog Input Block 2	The AI Block receives the measuring data from the Sensor Block, (selectable via a channel number) and makes the data available to other function blocks at its output. Enhancement: digital outputs for process alarms, fail safe mode.	2	25 ms	enhanced
Digital Input Block	This block contains the discrete data of the Diagnose Block (selectable via a channel number 10 to 15) and provides them for other blocks at the output.	1	20 ms	standard
Digital Output Block	This block converts the discrete input and thus initiates an action (selectable via a channel number) in the DP Flow Block or in the im TRD1 Block. Channel 20 resets the counter for max. pressure transgressions value and Channel 21 resets the Totalizer.	1	20 ms	standard
PID Block	The PID Block serves as a proportional-integral-derivative controller and is used almost universally for closed-loop-control in the field including cascade and feedforward. Input IN can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_CONTENT).	1	40 ms	standard
Arithmetic Block	This block is designed to permit simple use of popular measurement math functions. The user does not have to know how to write equations. The math algorithm is selected by name, chosen by the user for the function to be performed.	1	35 ms	standard
Input Selector Block	The Input Selector Block facilitates the selection of up to four inputs and generates an output based on the configured action. This block normally receives its inputs from AI Blocks. The block performs maximum, minimum, average and 'first good' signal selection. Inputs IN1 to IN4 can be indicated on the display. The selection is performed in the Display Block (DISPLAY_MAIN_LINE_1_CONTENT).	1	30 ms	standard
Signal Characterizer Block	The Signal Characterizer Block has two sections, each with an output that is a nonlinear function of the respective input. The nonlinear function is generated by a single look-up table with 21 arbitrary x-y pairs.	1	40 ms	standard
Integrator Block	The Integrator Block integrates a variable as a function of the time or accumulates the counts from a Pulse Input Block. The block may be used as a totalizer that counts up until reset or as a batch totalizer that has a setpoint, where the integrated or accumulated value is compared to pre-trip and trip settings, generating a binary signal when the setpoint is reached.	1	35 ms	standard

Additional function block information:

Instantiate Function Block	YES
Number of instantiate blocks	20

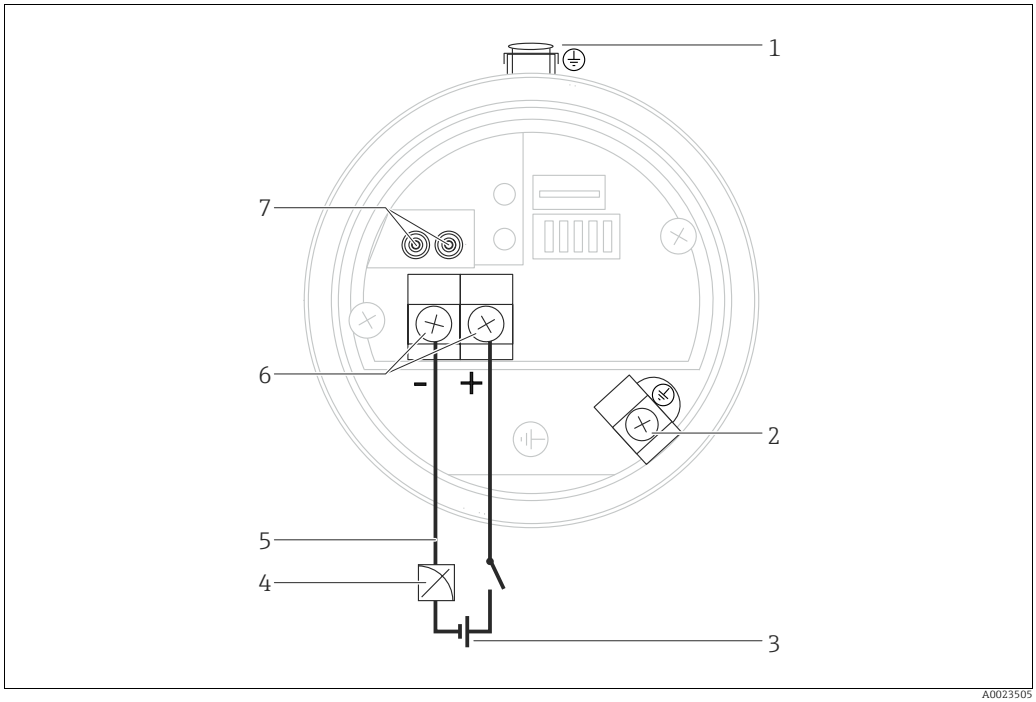
Power supply

⚠ WARNING

An incorrect connection compromises electrical safety!

- When using the measuring device in hazardous areas, the relevant national standards and regulations as well as the safety instructions or installation or control drawings must be observed. → 47, "Safety Instructions" and "Installation/Control Drawings" sections.
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas → 47, sections "Safety InstructionsSafety Instructions" and "Installation/ Control drawing".
- According to IEC/EN61010 a suitable disconnector has to be installed for the device.
- HART: Overvoltage protection HAW569-DA2B for the non-hazardous area, ATEX II 2 (1) Ex ia IIC and IEC Ex ia can be ordered as an option (see "Ordering information" section).
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply.

Terminal assignment



Electrical connection

1 *External grounding terminal*
2 *Internal grounding terminal*
3 *Supply voltage → 18*
4 *4...20 mA for HART devices*
5 *For HART and FOUNDATION Fieldbus devices: With a handheld terminal, all the parameters can be configured anywhere along the bus line via menu operation.*
6 *Terminals*
7 *For HART devices: test terminals, see section "Taking a 4 to 20 mA test signal"*

Supply voltage

4 to 20 mA HART

Type of protection	Supply voltage
▪ Intrinsically safe	11.5 ... 30 V DC
▪ Other types of protection ▪ Devices without certificate	11.5 ... 45 V DC (Versions with plug-in connection 35 V DC)

Taking a 4 to 20 mA test signal

A 4 to 20 mA test signal may be measured via the test terminals without interrupting the measurement.

PROFIBUS PA

- Version for non-hazardous areas: 9 to 32 V DC

FOUNDATION Fieldbus

- Version for non-hazardous areas: 9 to 32 V DC

Current consumption

- PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21
- FOUNDATION Fieldbus: 16 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

Electrical connection

Cable entry	Degree of protection	Version[1)]
M20 coupling	IP66/68 NEMA 4x/6P	A
M20 thread	IP66/68 NEMA 4X/6P	B
G ½" thread	IP66/68 NEMA 4X/6P	C
NPT ½" thread	IP66/68 NEMA 4X/6P	D
M12 connector	IP66/67 NEMA 4X/6P	I
7/8" connector	IP66/68 NEMA 4X/6P	M
HAN7D plug 90 degrees	IP65	P
M16 valve connector	IP64	V

1) Product Configurator "Electrical Connection" section

PROFIBUS PA

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply. For further information on the network structure and grounding, and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning" and the PNO Guideline.

FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply. For further information on the network structure and grounding and for further bus system components such as bus cables, see the relevant documentation, e.g. Operating Instructions BA00013S "FOUNDATION Fieldbus Overview" and the FOUNDATION Fieldbus Guideline.

Terminals

For wire cross-sections of 0.5 to 2.5 mm² (20 to 14 AWG).

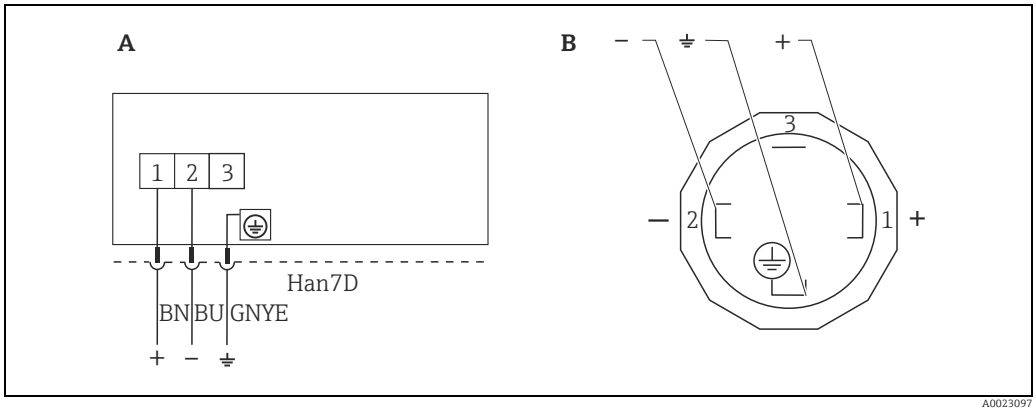
Cable entry

Approval	Type	Clamping area
Standard, II1/2G Exia, IS	Plastic M20x1.5	5 to 10 mm (0.2 to 0.39 in)
ATEX II1/2D, II1/2GD Exia, II3G Ex nA	Metal M20x1.5 (Ex e)	7 to 10.5 mm (0.28 to 0.41 in)

For additional technical data, see housing section → 32 ff".

Device plug connectors

Devices with valve connector

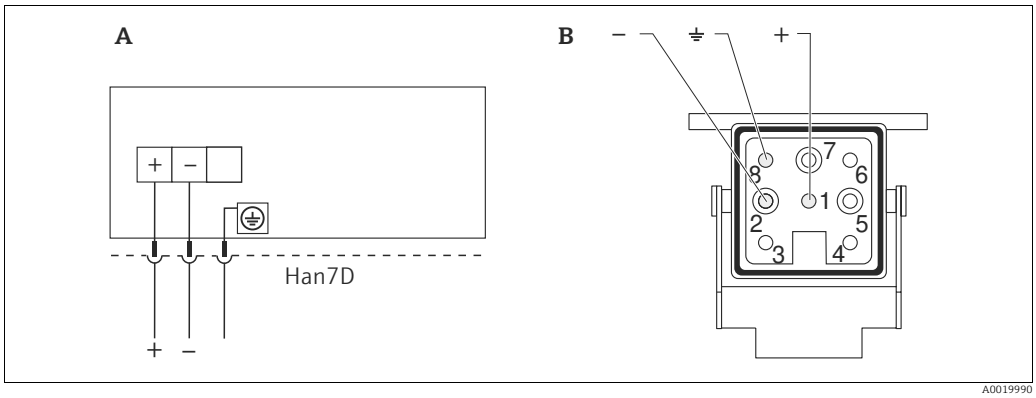


BN = brown, BU = blue, GNYE = green/yellow

A Electrical connection for devices with valve connector
B View of the plug connector at the device

Material: PA 6.6

Devices with Harting plug Han7D

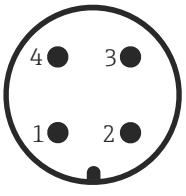


A Electrical connection for devices with Harting plug Han7D
B View of the plug-in connector at the device

Material: CuZn, contacts for plug-in jack and connector are gold-plated

Devices with M12 plug

PIN assignment for M12 connector

PIN assignment for M12 connector	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal –
	4	Earth

Endress+Hauser offers the following accessories for devices with an M12 connector:
Plug-in jack M 12x1, straight
- Material: body PA; coupling nut CuZn, nickel-plated

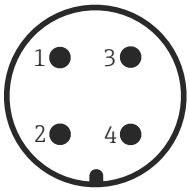
- Degree of protection (fully locked): IP66/67
- Order number: 52006263

Plug-in jack M 12x1, elbowed
- Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
- Degree of protection (fully locked): IP66/67
- Order number: 71114212

Cable 4x0.34 mm² (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)
- Material: body PUR; coupling nut CuSn/Ni; cable PVC
- Degree of protection (fully locked): IP66/67
- Order number: 52010285

Devices with 7/8" plug

PIN assignment for 7/8" connector

PIN assignment for 7/8" connector	PIN	Meaning
 A0011176	1	Signal –
	2	Signal +
	3	Not assigned
	4	Shield

External thread: 7/8 - 16 UNC
- Material: 316L (1.4401)
- Protection: IP66/68

Cable specification

HART

- Endress+Hauser recommends using a twisted, shielded two-wire cable.
- The outer diameter of the cable depends on the cable entry used.

PROFIBUS PA

Use a twisted, shielded two-wire cable, preferably cable type A

For further information on the cable specifications, see Operating Instructions BA00034S "PROFIBUS DP/PA: Guidelines for planning and commissioning", the PNO Guideline 2.092 PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

FOUNDATION Fieldbus

Use a twisted, shielded two-wire cable, preferably cable type A

For further information on the cable specifications, see Operating Instructions BA00013S "FOUNDATION Fieldbus Overview", FOUNDATION Fieldbus Guideline and IEC 61158-2 (MBP).

Startup current HART

12 mA or 22 mA (selectable)

Residual ripple

Without influence on 4 to 20 mA signal up to ± 5 % residual ripple within the permitted voltage range [according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)]

Influence of power supply

≤ 0.001% of URL/V